e- $Q_m = C.U_0$

$$\Rightarrow C = \frac{Q_m}{U_0} = \frac{12.10^{-6}}{12} = 10^{-6}F$$

$$\underline{C = 10^{-6}F}$$

$$\omega_0^2 = \frac{1}{LC} \Rightarrow L = \frac{1}{10^{-6}.(250\pi)^2} = 1{,}6H$$

$$\underline{L = 1{,}6H}$$

2°)

a- $E = E_e + E_L$

$$= \frac{1}{2}Cu_C^2 + \frac{1}{2}Li^2$$

b-

$$\frac{dE}{dt} = \frac{1}{2}C\left(2u_c\frac{du_c}{dt}\right) + \frac{1}{2}L\left(2i\frac{di}{dt}\right)$$

$$\frac{dE}{dt} = C\ u_c\frac{du_c}{dt} + Li\frac{di}{dt} = i\,u_c + Li\frac{di}{dt}$$

$$= i\left(u_c + L\frac{di}{dt}\right) = i(u_c + u_L)$$

$\frac{dE}{dt} = 0 \Rightarrow$ l'energie reste cste

$$\begin{cases} i = I_{max} \\ q = 0 \Rightarrow U_c = 0 \\ E = \frac{1}{2}L\ I_{max} \end{cases}$$

c- $E = \frac{1}{2}C\ u_c^2 + \frac{1}{2}Li^2 = \frac{1}{2}L\ I_{max}^2$

$$C\ u_c^2 = Li^2 - L\ I_{max}^2$$

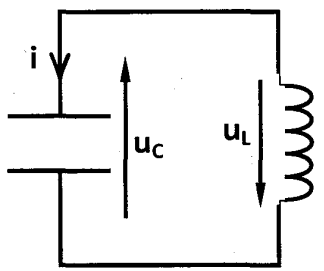
$$C\ u_c^2 = L(I_m^2 - i^2)$$

$$u_c^2 = \frac{L}{C}\left(I_m^2 - i^2\right)$$

$$\omega_0^2 = \frac{1}{LC} = 6.2500\pi^2$$

Exercice N°9 :

1°) *lois des mailles :



$$u_c + u_L = 0$$

or $u_c = \frac{q}{c}$ et $u_L = L\frac{di}{dt} = L\frac{d^2q}{dt^2}$

$$\Rightarrow L\frac{d^2q}{dt^2} + \frac{q}{c} = 0 \Rightarrow \frac{d^2q}{dt^2} + \frac{q}{LC} = 0$$

* $q = C.u_c \Rightarrow \frac{dq}{dt} = C\frac{du_c}{dt} \Rightarrow \frac{d^2q}{dt^2} = c\frac{d^2u_c}{dt^2}$

$$\Rightarrow C\frac{d^2u_c}{dt^2} + \frac{1}{LC}(C.u_C) = 0 \Rightarrow \frac{d^2u_C}{dt^2} + \frac{1}{LC}u_C = 0$$

* $u_C = -u_L \Rightarrow -\frac{d^2u_L}{dt^2} + \frac{1}{LC}(-u_L) = 0 \Rightarrow \frac{d^2u_L}{dt^2} + \frac{1}{LC}u_L = 0$